What is claimed is:

1. A method for surface modification in manufacturing high temperature superconducting device, comprising the step of:

bombarding a surface of a preformed material with a particle beam having energy to increase the smoothness of the material surface and change the microstructure or internal defect of the processed material;

wherein the energy of the particle beam is in the range of 5-50000eV, and the incidence angle of the particle beam is in the range of 5-85 degree.

2. The method according to claim 1, wherein the material is MgO, and the incidence angle of the particle beam is in the range of 35-85 degree.

3. The method according to claim 1, wherein the material is CeO_2, and the incidence angle of the particle beam is in the range of 45-85 degree.

4. The method according to claim 1, wherein the material is a cold rolled Ni substrate, and the incidence angle of the particle beam is in the range of 10-80 degree.

5. The method according to claim 1, wherein the material is YBCO, and the incidence angle of the particle beam is in the range of 5-85 degree.

6. The method according to claim 1, wherein the material is any one of following metal materials: Ni, NiO, Ni alloy, Cu, Cu alloy, Ag, Ag alloy, Fe, Fe alloy, Mg and Mg alloy, purities of the alloy materials are more than 99%, and alloying constituents of the metal alloys are at least 0.01wt.%.

7. The method according to claim 1, wherein the material is any one of following semiconductor materials: Si, Ge, GaAs, InP, InAs, InGaAs, CdS, GaN, InGaN, GaSb and InSb.

8. The method according to claim 1, wherein the material is any one of following oxide materials: $SrTiO_3$, $LaAlO_3$, Y_2O_3, RuO_2, CeO_2, MgO, ZrO_2, SiO_2, Al_2O_3 and yttria-stabilized zirconia (YSZ).

9. The method according to claim 1, wherein the material is any one of the following superconducting materials: $YBa_2Cu_3O_{7-\delta}$ ($0<\delta<0.5$), $REZ_2Cu_3O_{7-\delta}$ (RE is a rare earth element, Z is an alkaline rare earth element, $0<\delta<0.5$), Bi-Sr-Ca-Cu-O, TI-Ba-Ca-Cu-O.

10. The method according to claim 1, wherein the modification of the material is bulk, external or internal.

11. The method according to claim 1, wherein the surface of the material is monocrystalline, amorphous or polycrystalline structure.

12. The method according to claim 1, wherein the surface of the material is polished or unpolished.

13. The method according to claim 1, wherein the material is a substrate, a transition layer, a superconducting layer preformed in the process of manufacturing the superconducting device, or any combination of them.

14. The method according to claim 1, wherein the particle beam is a plasma, an ion beam, or any one of ion beam fluxes containing charged ions of O_2 and Ar, N_2 and O_2, or H_2 and Ar.

15. The method according to claim 1, further comprising annealing the material bombarded with the particle beam, wherein the annealing temperature is in the range of 100-1500℃.

16. The method according to claim 6, wherein alloying constituents of the metal alloys are at least 0.1wt.%.

17. A high temperature superconducting device, comprising:

a substrate; and

a high temperature superconducting film formed on the substrate,

wherein the high temperature superconducting film exhibits oblique cone topography characteristic after being bombarded with a particle beam having energy, the energy of the particle beam is in the range of 5-50000eV, and the incidence angle of the particle beam is in the range of 5-85 degree.

18. The high temperature superconducting device according to claim 17, wherein the high temperature superconducting film is annealed after being bombarded with the particle beam, and the annealing temperature is in the range of 100-1500℃.